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June 8, 1992

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

RE: ET Docket No. 92-9

Dear Ms. Searcy:

Transmitted herewith on behalf of Harris Corporation-Farinon Division are an original and nine copies of its Comments in response to the Notice of Proposed Rulemaking in the above-referenced proceeding.

Should any additional information be desired, please communicate with this office.

Very truly yours,

Barry Lambergman

Barry Lambergman
Counsel for
Harris Corporation -
Farinon Division

BL/es
Enclosure

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BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies	)	ET Docket No. 92-9

COMMENTS OF HARRIS CORPORATION - FARINON DIVISION

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Its Attorneys

June 8, 1992

TABLE OF CONTENTS

SUMMARY

For Harris Corporation - Farinon Division, one of the nation's leading manufacturers and suppliers of terrestrial fixed microwave equipment, adoption of the NPRM in this proceeding has effectively halted sales of new 2 GHz microwave equipment for fixed services under both Parts 21 and 94. For Harris, this translates into a loss of approximately $1 million per month in sales. The significance of this figure goes beyond the impact on one U.S. company because it gives some indication of the extent to which U.S. industry has come to rely on the 2 GHz band and, consequently, the detrimental impact that displacing the current fixed licensees in that band would have on the nation's economy. Thus, while Harris supports the Commission's goal of making spectrum available for new technologies, it urges the Commission to examine alternative band(s) (e.g., 2.5 GHz band) for the proposed "spectrum reserve" that would not be as costly and that would not exact such a severe public interest toll.

Nevertheless, if the Commission does decide to reallocate the 2 GHz terrestrial fixed bands, then it should: (1) retain co-primary status for the fixed services outside of major urban areas; (2) adopt its proposed "blanket" waiver of the eligibility rules; (3) adopt appropriate technical rules, prior to reallocation, to enable fixed microwave users displaced from the 2 GHz band, as well as new would-be users of that band, to successfully share the higher bands; and (4) establish an industry advisory committee to develop these new technical requirements and interference standards.

BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies	)	ET Docket No. 92-9

COMMENTS OF HARRIS CORPORATION - FARINON DIVISION

Harris Corporation - Farinon Division ("Harris"), by its attorneys, hereby submits its Comments in response to the Notice of Proposed Rule Making released on February 7, 1992 in the above-captioned proceeding.

Harris is a Florida corporation with its headquarters located in Melbourne, Florida. Through its Farinon Division, located in San Carlos, California, Harris designs, develops and manufactures microwave equipment for terrestrial fixed microwave systems. Harris offers both analog and digital product lines with bandwidths ranging from 800 kHz to 10 MHz and above. As a leading manufacturer of microwave equipment, particularly for use in the 2 GHz band, Harris is keenly interested in the Commission's proposal to reallocate the 2 GHz band.

Although only at the NPRM stage, this proceeding has already had a severe impact on Harris's business. Sales of new 2 GHz microwave equipment for fixed services under both Parts 21 and 94 effectively came to halt as of the middle of January when the NPRM was adopted. For Harris, this has translated into a loss of approximately $1 million per month in sales. Harris is also

interested in this proceeding from the standpoint of its many customers who have purchased 2 GHz microwave systems and to whom relocation to another band would mean a difficult and expensive hardship, not to mention the very real possibility that the reliability of their communication systems will be compromised as a result.

I. REALLOCATION OF THE 2 GHz BAND IS NOT IN THE PUBLIC INTEREST AND, IN ANY EVENT, IS PREMATURE

The Commission has already developed a substantial record in its PCS proceeding (General Docket No. 90-314) showing that reallocation of spectrum in the 2 GHz band would be detrimental to private operational-fixed microwave users because alternative means of communications, such as higher microwave bands, common carrier wireline facilities, fiber optics, and satellites are either too costly, unavailable where needed, too unreliable, and/or cannot satisfy operational requirements in terms of technical quality and control. The record in that proceeding also shows that reallocation of the 2 GHz band would have a seriously detrimental effect on the nation's economy as well because that band is used primarily by those U.S. industries which provide the basic infrastructure on which the rest of the economy is based. In light of this record, reallocation of the 2 GHz band would not be in the public interest.

Many of the proponents of reallocating the 2 GHz band, including some of the Commissioners at the PCS en banc hearing, have questioned the basis for private microwave users' claims

that alternatives to the 2 GHz band do not provide the necessary degree of reliability. In Harris's view, only the private microwave user can define the degree of reliability needed for its operation, particularly where the microwave system is being used for highly specialized and safety-related operations, as is quite often the case.

One of the specific alternatives to the 2 GHz band that has often been raised in the PCS proceeding and which is cited in the NPRM is the 6 GHz band. In this connection, Harris notes that, as demonstrated by Exhibit 1 attached hereto, the 2 GHz band provides more reliable propagation than does the 6 GHz band on long and difficult paths (e.g., those paths on which atmospheric conditions cause refraction of the signal).

Harris would also note that, apart from reliability, in many areas the 6 GHz band is already congested in many areas and could not accommodate all of the numerous migrants from the 2 GHz band.[1] Moreover, even if the 6 GHz band is able to accommodate displaced occupants of the 2 GHz band, the effect of that relocation will be to make any expansion of microwave systems operating in the 6 GHz band extremely difficult, if not impossible.

Given the substantial factors militating against

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[1] Although not all private microwave stations would need to be relocated, it is clear that a substantial number would because, as noted in the petition filed by Utilities Telecommunications Council ("UTC"), there are approximately 29,000 facilities licensed in the 2 GHz band. See Petition for Rule Making filed by UTC (March 31, 1992) at 4 ("UTC Petition").

reallocation of the 2 GHz band, the Commission's statutory public interest obligations impose on it a heavy burden of demonstrating that there are no suitable alternatives available that would not exact such a severe public interest toll. To date, the Commission clearly has not met this burden. There are several other bands besides the 1.85-1.99, 2.11-2.15 and 2.16-2.2 GHz bands to which the Commission has not given due consideration.

For example, UTC filed a petition on May 1, 1992, requesting that the Commission adopt a further notice of proposed rule making in this proceeding to consider the wireless cable (2500-2690 MHz) band for emerging technologies.[2] As UTC noted therein, whereas the 2 GHz band contains approximately 29,000 facilities, the 2.5 GHz band has only about 3,500 multichannel multipoint distribution service, instructional television fixed service, and operational-fixed service licensees. UTC also noted that whereas the cost of relocating incumbent 2 GHz band licensee would be on the order of $4 billion, the cost of relocating existing 2.5 GHz band users would be only about $500 million.

In any event, the point is that the disruption of vital point-to-point services without giving serious consideration to other bands would not be in the public interest. Until the Commission studies other bands, reallocation of the 2 GHz

---

[2] UTC also requested that the Commission consider the TV auxiliary broadcasting (1990-2110 MHz) band. In this regard, Harris believes that UTC raises a very valid question, namely, why the Commission accorded more weight to the concerns of broadcasters than to those of the utility, public safety, petroleum and railroad industries.

terrestrial fixed microwave bands would be premature.

II. IF THE COMMISSION DOES REALLOCATE THE 2 GHz BAND, IT SHOULD RETAIN CO-PRIMARY STATUS FOR THE FIXED SERVICES OUTSIDE OF MAJOR URBAN AREAS

Many of the proposals for services in the emerging technologies bands, particularly PCS, are likely to be economically viable only in metropolitan areas. Yet, point-to-point use of the 2 GHz band would, for all intents and purposes, still be precluded everywhere because many licensees will be unwilling to operate on a secondary basis and, more significantly, microwave equipment manufacturers will permanently cease production of 2 GHz microwave equipment if the band is relegated to secondary status across-the-board.

Therefore, Harris believes that the fixed microwave allocations should remain co-primary at least outside of the major urban areas. Co-equal sharing should be feasible in these areas for a number of reasons. First, there should be sufficient amounts of unused 2 GHz spectrum to accommodate the relatively light demand for PCS services in these areas. Second, PCS proponents have indicated that sharing will be feasible because their equipment will incorporate such features as adaptive power control and adjustable notch filters that will enable them to establish "exclusion zones" around fixed systems.[3] Finally, the potential for PCS operations to cause interference to point-

---

[3] See, e.g., Report of Experimental Testing filed by PCN America, Inc. ("PCNA") on June 14, 1991, at 6, 124 and 155.

to-point microwave operations in these areas can be further reduced by improved microwave equipment design. For example, newer models of digital microwave equipment will exhibit a greater tolerance to interference and will better be able to compensate for a potentially interfering PCS signal in the immediate vicinity through advanced features such as automatic transmitter power control.

In view of the apparent ability of PCS and terrestrial fixed microwave operations to co-exist outside of major urban areas, there is no justification for downgrading these fixed operations to secondary status. Indeed, effectively forcing these fixed users to vacate the 2 GHz band will only exacerbate the problem of accommodating the fixed users displaced from the 2 GHz band in urban areas.

III. THE PROPOSED MIGRATION PLAN IDENTIFIES SPECTRUM WHICH PRIVATE AND COMMON CARRIER MICROWAVE USERS SHOULD BE ABLE TO SHARE, BUT DOES NOT SPECIFY HOW THAT SHARING WOULD BE ACCOMPLISHED

In paragraph 20 of the NPRM, the Commission sets forth its plan for reaccommodating fixed microwave operations currently licensed in the 2 GHz band. Specifically, it proposes to grant a "blanket" eligibility waiver and make available all fixed microwave bands above 3 GHz, both common carrier and private, to all existing 2 GHz fixed microwave users. In footnote 16 the Commission identifies the specific bands that would be available for this reallocation, namely, the 3.7-4.2, 5.925-6.425, 6.525-6.875, 10.7-11.7, 11.7-12.2, 12.7-13.25, and 17.7-19.7 GHz bands.

With the possible exception of the 3.7-4.2 GHz band,[4] Harris agrees with the Commission that both Part 21 and Part 94 eligibles should be able to successfully share these fixed microwave bands. For example, private and common carrier users have shared the fixed frequencies at 10.55-10.68 GHz and 17.7-19.9 GHz bands without difficulties for a number of years. Moreover, the fact that common carrier users have been steadily migrating to fiber optic facilities in recent years would facilitate the migration of private microwave users to the common carrier bands.

In addition to the frequency bands listed in the NPRM, Harris suggests that the Commission also consider the 3.5-3.7 GHz band. In Canada, the 3.7-4.2 GHz band has been extended down to include the 3.5-3.7 GHz band and is being used for common carrier operations. Harris believes that this band would be potentially useful to the fixed microwave services displaced from the 2 GHz band. The band could be configured into 5, 10 and 20 MHz sub-channels, and be made available to existing and future Part 94

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[4] The Commission's intent in reallocating the 12.2-12.7 GHz band to DBS in 1982 was to provide for inexpensive television reception in many areas of the U.S. not served by other television distribution methods. Since service in that band has not developed to date, much of the rural and suburban U.S. has employed satellite TV receivers in the 3.7-4.2 GHz allocation. The widespread use of unprotected TVRO satellite dishes in the 3.7-4.2 GHz band in rural and many suburban communities creates a "political" problem in terms of potential microwave interference to these receivers. Interference into these home receivers often results in complaints directed towards executive personnel of the firm supplying the fixed microwave service, thereby making the use of that particular frequency option unattractive from the standpoint of the microwave operator.

and Part 21 licensees.

Harris also suggests that the Commission consider making available for commercial use the government band 1710-1850 MHz, or a portion thereof. In making this recommendation, Harris has taken into account the draft report of the Department of Commerce titled Federal Spectrum Usage of the 1710-1850 and 2200-2290 MHz Bands, March 1995, ("NTIA Report"), which has been placed in the docket file of this proceeding. While Harris recognizes that the NTIA Report shows that the federal government makes substantial use of the band, the uses described in the Report do not preclude, in Harris' view, some (perhaps substantial) additional use of the band by the private microwave and common carrier systems the Commission has proposed to relocate from the 2 GHz bands. Availability of the frequencies in this range of the spectrum is important, particularly for the type of difficult paths described in Exhibit 1 hereto and for those systems which must use frequencies in the 2 GHz range in order to achieve the required degree of reliability.

Although the government uses the 1710-1850 MHz for fixed and mobile systems as well as for satellite uplinks, Harris believes that non-government users should be able to successfully share this band. Coordination would be facilitated by the fact that approximately 87 percent of the total frequencies authorized in the 1710-1850 MHz band are for fixed systems. NTIA Report at xix and 4-3. Conversely, government earth stations in the band are relatively few and are located in well known and well defined

areas. See NTIA Report at Table 3-2, p. 3-3, which lists the 10 locations where earth stations are authorized in the 1710-1850 MHz band. Further, the non-government sector has substantial experience in coordinating diverse services within the same band (e.g., the 6 GHz common carrier band is used for both fixed, temporary-fixed, and satellite communications).

Thus, while the 5539 government assignments in the 1710-1850 MHz band represent substantial usage and while, as the NTIA Report indicates, the government plans to continue assigning frequencies in this band to future government systems, Harris believes that a substantial number of non-government point-to-point systems can be coordinated in that band without adversely affecting existing or future federal government systems. Accordingly, Harris recommends that the Commission undertake serious consultation with NTIA looking toward opening the 1710-1850 MHz band, or a portion thereof, to non-government microwave users.

In any event, the larger point here is that while the Commission's plan identifies spectrum which private and common carrier microwave users should be able to share, it does not specify how that sharing would be accomplished other than to say existing 2 GHz fixed operations that relocate to the common carrier bands would be subject to the coordination procedures of Section 21.100 and 21.706, and those that relocate to private operational-fixed bands would be subject to the coordination procedures of Section 94.63. As explained in both the UTC

petition and the petition filed by Alcatel on May 22, 1992, this plan does not go far enough. It does not include the technical rules needed to make this transition workable (e.g., coordination procedures, channelization plans, and standards governing minimum channel loading, path length, frequency modulation efficiency, and antenna design).

Therefore, as Harris urged in the comments it filed on June 1, 1992, in support of the UTC Petition, the Commission should defer action in the above-captioned proceeding until it adopts the type of technical and coordination rules mentioned above. The Commission should also establish an industry advisory committee to develop these new technical requirements and interference standards.

In the absence of such technical rules, private microwave users will be unable to use the higher common carrier bands. It is not enough simply to subject private microwave users to the existing Part 21 technical standards, as the Commission appears to be proposing. The Part 21 rules are geared mainly toward the high capacity systems of common carriers and are generally not suited to accommodate the relatively low capacity systems operated by many private microwave users.

For example, while the channelization of the 1.85-1.99 GHz private microwave band is comparable to that of the private microwave band 6.525-6.875 MHz, it is not at all comparable to the de facto channelization of the 3.7-4.2 or 5.925-6.425 GHz common carrier bands. It would be even more difficult to

accommodate existing 2.1 and 2.2 GHz band users in the "higher" bands as currently configured. The two private bands at 2 GHz (i.e., 2.13-2.15 and 2.18-2.2 GHz), are used for "skinny" routes with 800 kHz bandwidth channels regularly assignable, and 1.6 MHz channels assignable on a showing of need. As noted in the UTC Petition, there are only nine pairs of channels with comparable bandwidth in the 6.5-6.8 GHz private microwave band, which is not enough to accommodate existing systems in the 2.1-2.2 GHz private microwave bands, let alone new users.

Similarly, cellular systems, which are the fastest growing group of point-to-point microwave users and which, until adoption of the NPRM, had relied heavily on the narrowband frequencies available in the 2 GHz common carrier bands (2.11-2.13 and 2.16-2.18 GHz) for connecting cell sites, generally do not have comparable narrowband frequencies available in higher bands. The 2 GHz common carrier bands are also heavily used for other relatively low capacity systems operating within 0.8 to 3.5 MHz channels. While some of the cellular and other low capacity systems can be accommodated under existing rules in some portions of the higher common carrier bands, reconfiguration of these bands will make them useful to cellular and other low capacity common carrier systems as well as to private systems.

IV. CONCLUSION

For the reasons set forth above, Harris urges the Commission to issue a Further NPRM in this proceeding to examine the

possibility of using a band or bands other than the 1.85-1.99, 2.11-2.15 and 2.16-2.20 GHz bands for its proposed "spectrum reserve."

Nevertheless, if the Commission does decide to reallocate these bands, then it should: (1) retain co-primary status for the fixed services outside of major urban areas; (2) adopt its proposed "blanket" waiver of the eligibility rules; (3) adopt appropriate technical rules in a companion proceeding, prior to the reallocation proposed in this proceeding, to enable fixed microwave users displaced from the 2 GHz band, as well as new would-be users of that band, to successfully share the higher bands; and (4) establish an industry advisory committee to develop these new technical requirements and interference standards.

Respectfully submitted,

HARRIS CORPORATION -
FARINON DIVISION

By: Barry Lambergman
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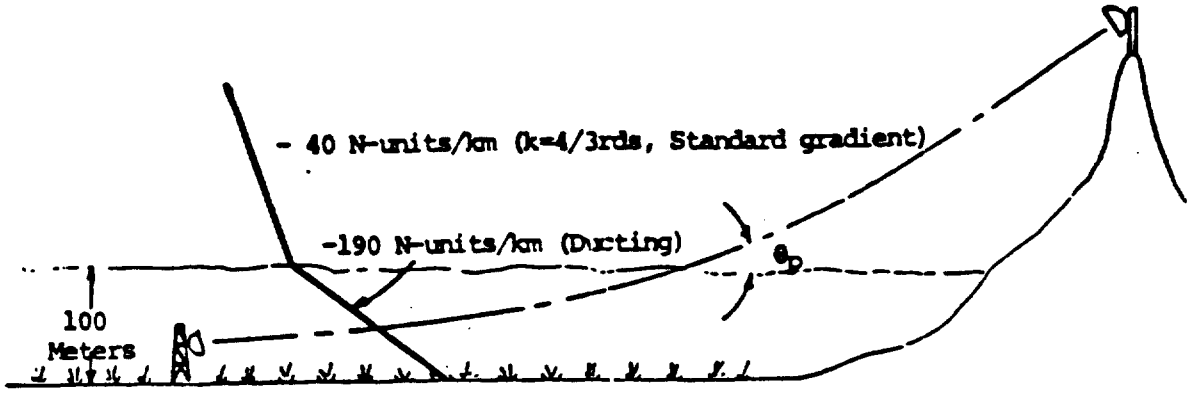
June 8, 1992

BL#39/92-9.HF

EXHIBIT 1

MINIMUM DUCT ENTRAPMENT FREQUENCY



$$f_{min}\ (MHz) = 0.1193/h^{3/2}(-dn/dh-1/a)^{1/2}$$

where:

h = duct thickness, km 100 meters (100×10^{-3} km)

dn/dh = refractive index gradient through the layer, N-units x 10^{-6} km

-190×10^{-6} N-units/km (typical, during ducting)

1/a = $1/6378$ km = 157×10^{-6} a = earth's radius, km

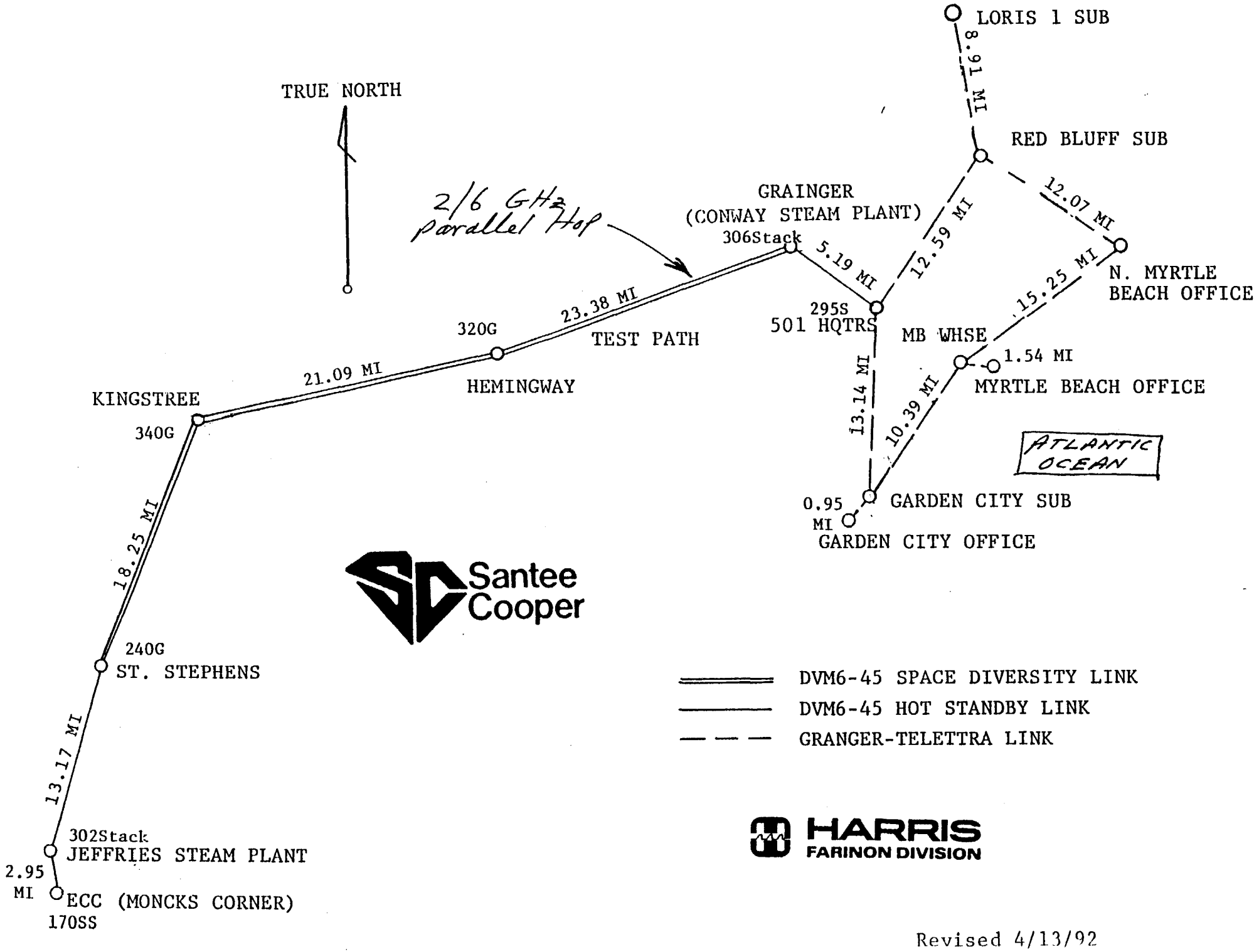
EXAMPLE:

$$f_{min}\ (MHz) = 0.1193/\left((100 \times 10^{-3})^{3/2}\left[(190-157)\ 10^{-6}\right]^{1/2}\right)$$

$$= 657\ MHz$$

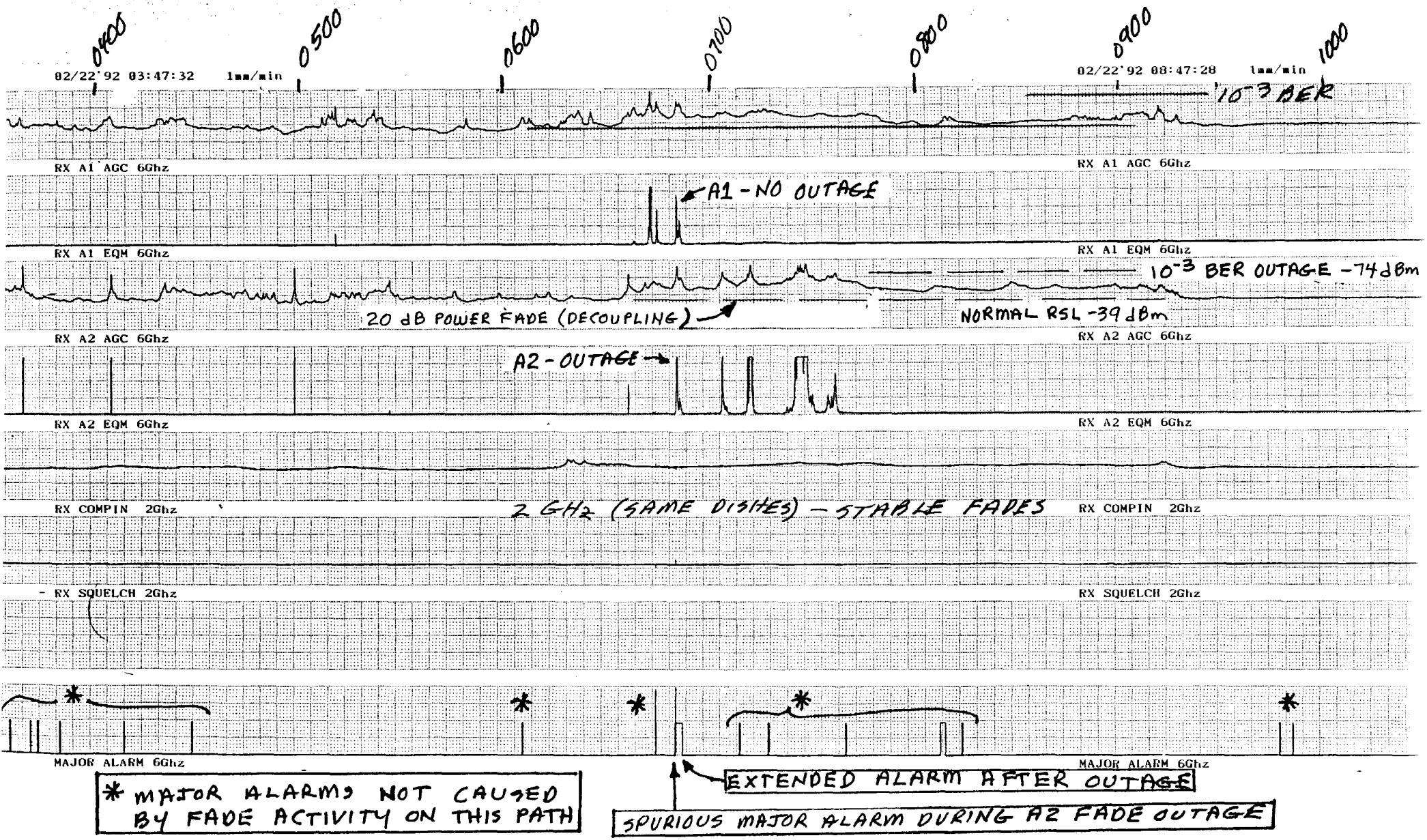
Frequencies lower than that computed above will be less likely to be trapped, while those higher in frequency will be more vulnerable. This relates, again, to propagation within the layer, not penetration of the ray through an atmospheric discontinuity or upper duct boundary. Thus, with a "flat" penetration angle (horizontal path) the 2000 MHz signal could be entrapped in a 100 m deep ducting layer. The entrapment frequency for a 40 m layer is 2595 MHz, so the frequency of occurrence (probability) of layer thickness must be known to complete this computation.

HARRIS
FARINON DIVISION



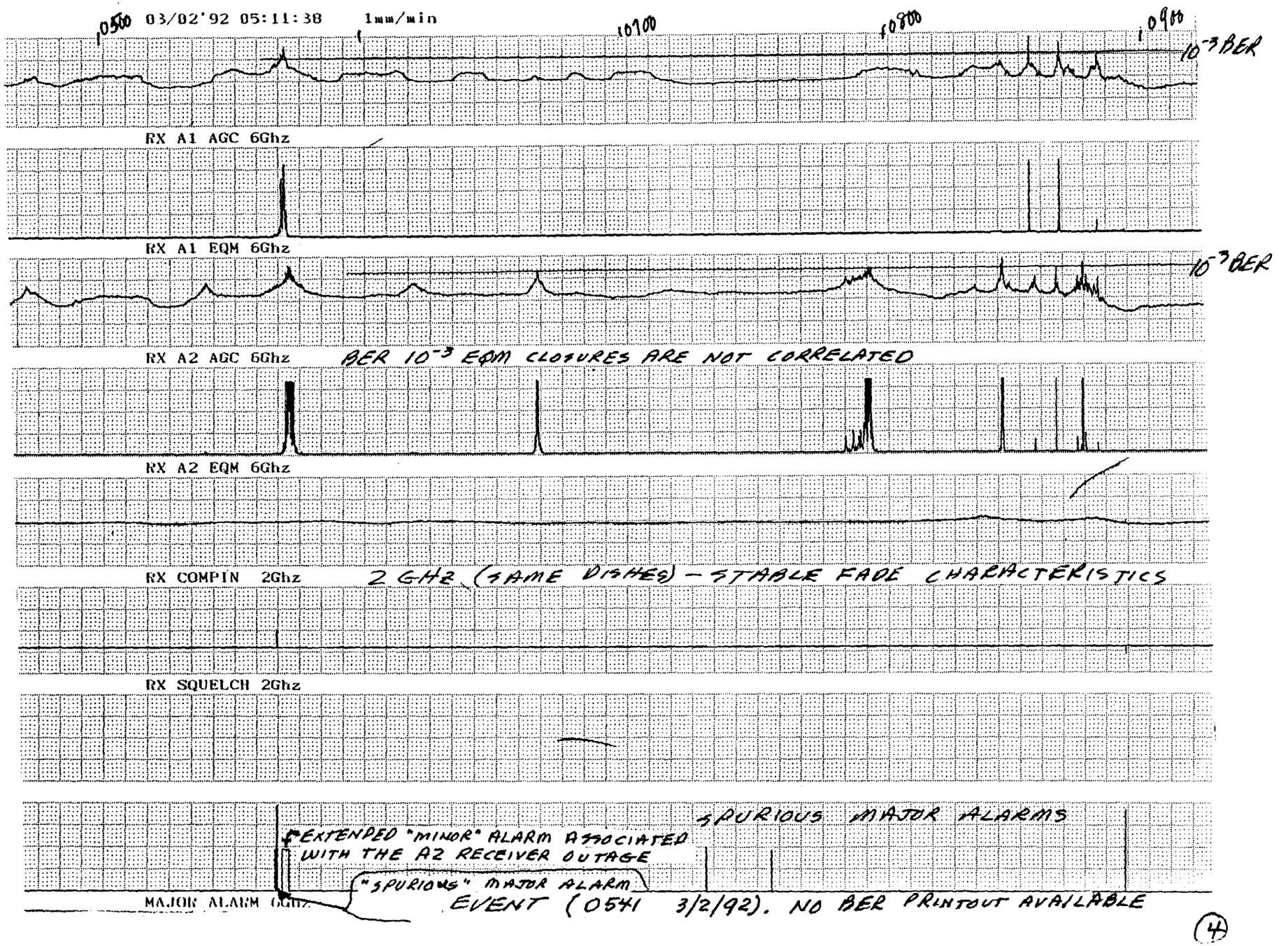
Revised 4/13/92

FEBRUARY 22, 1992
SANTEE COOPER OUTAGE EVENT
DURING DUCT FADE ACTIVITY



* MAJOR ALARMS NOT CAUSED BY FADE ACTIVITY ON THIS PATH

2/22/92 HEMINGWAY - GRAINGER FADE OUTAGE AT 0650
REPORTED AS A 15 SEC DURATION BER EVENT (SEE ATTACHED)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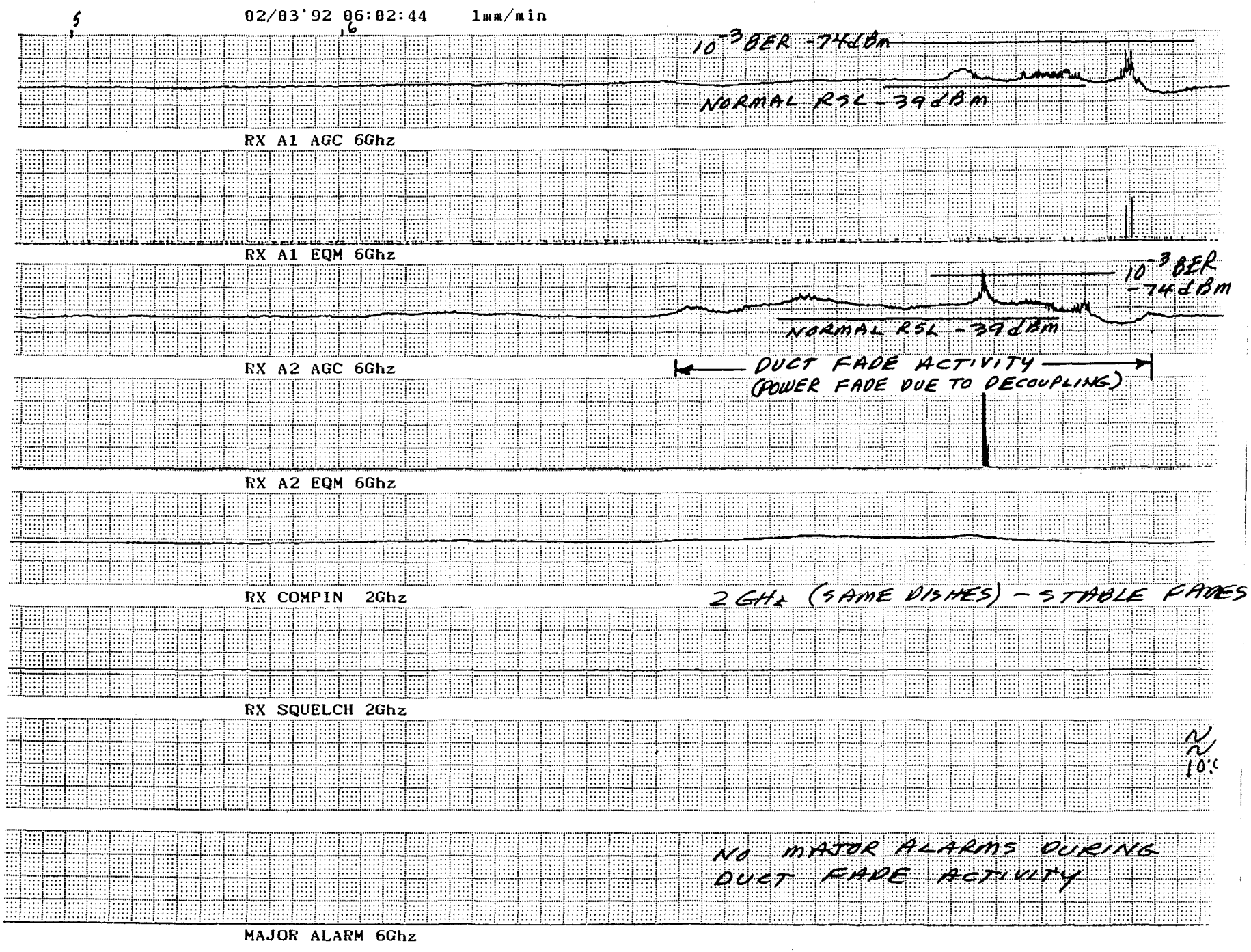
1070
1080
1090
10^{-3} BER
RX A1 AGC 6Ghz
RX A1 EQM 6Ghz
10^{-3} BER
RX A2 AGC 6Ghz
BER 10^{-3} EQM CLOSURES ARE NOT CORRELATED
RX A2 EQM 6Ghz
RX COMPIN 2Ghz
2 GHz (SAME DISHES) - STABLE FADE CHARACTERISTICS
RX SQUELCH 2Ghz
SPURIOUS MAJOR ALARMS
EXTENDED "MINOR" ALARM ASSOCIATED WITH THE A2 RECEIVER OUTAGE
"SPURIOUS" MAJOR ALARM
MAJOR ALARM 6Ghz
EVENT (0541 3/2/92). NO BER PRINTOUT AVAILABLE

(4)


5
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1mm/min
6
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NORMAL RSL -39dBm
RX A1 AGC 6Ghz
RX A1 EQM 6Ghz
10^{-3} BER
-74dBm
NORMAL RSL -39dBm
RX A2 AGC 6Ghz
DUCT FADE ACTIVITY
(POWER FADE DUE TO DECOUPLING)
RX A2 EQM 6Ghz
RX COMPIN 2Ghz
2 GHz (SAME DISHES) - STABLE FADES
RX SQUELCH 2Ghz
NO MAJOR ALARMS DURING
DUCT FADE ACTIVITY
MAJOR ALARM 6Ghz